Is Beta Still Alive in the Asia Pacific Region?

Nguyen Cong Thang
Vietnam-the Netherlands Economics Program
Vietnam

Vo Hong Duc
The Australian Energy Regulator, Melbourne &
HCMC Open University, Vietnam

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Abstract

This study examines the validity of the Capital Asset Pricing Model (1965) in the context of Australia on the ground of the pioneering work by Savor and Wilson (2014) for the US. In the heart of the CAPM, beta is considered an important measure of systematic risk. Daily data for more than 2,200 Australian listed firms are collected from Bloomberg for the period from 1 January 2007 to 31 December 2016. Various portfolios are considered in this study including: (i) 10 beta-sorted portfolios; (ii) 10 idiosyncratic risk-sorted portfolios (iii) 25 Fama-French size and book-to-market portfolios; and (iv) industry portfolios. Days with announcements (the *a-day*) in relation to *growth*, *inflation*, *employment*, *central bank announcements*, *bonds*, *housing*, *consumer surveys*, *business surveys* and *speeches* from the Prime Minister or the Governor of the Reserve Bank of Australia scheduled to be announced are allocated into the group which is separated from the *n-day* (*non-announcement days*) group. Findings from this study indicate that beta is negatively related to daily expected excess return in the announcement days in comparison to the non-announcement days. On balance, CAPM has proved to be a valid approach for estimating a return in Australia.

Key words: *Beta; Systematic Risk; Announcements; Australia*.

JEL Classification: G12; G14

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1 Introduction

Asset pricing is central to financial economics. Since the 1950s, this research area has attracted great attention from policymakers; academics; and practitioners. On the ground of the Modern Portfolio Theory (MPT), Markowitz (1952) presented the efficient frontier to demonstrate the trade-off between return and risk of an investment portfolio. Few years later, building on the earlier work of Markowitz (1952), the Capital Asset Pricing Model (CAPM) was developed by Sharpe (1964) and Lintner (1965).

The CAPM gained acceptance for use by academics and practitioners for an extended period of time until the introduction of the three-factor model by Fama and French in 1992. This three-factor model has been widely applied to explain the observed stock returns. In addition, various empirical studies provided evidence to argue that the CAPM does underestimate (overestimate) the return for low (high) beta asset. However, empirical evidence has generally provided mixed evidence in relation to the validity of CAPM for the purpose of estimating the expected equity return. Regardless of the criticism, CAPM still holds its position of superiority of acceptance and use. 74 per cent of 392 United State Chief Financial Officer (CFO) utilized CAPM to evaluate the cost of equity capital (Graham and Harvey, 2001). Similarly, Brounen, Jong and Koedijk (2004) discovered that 43 per cent of 313 European CFO's decisions used CAPM for the same purpose. Mckenzie and Partington (2014) in their report to the Australian Energy Regulator revealed that regulators in Australia, Germany, New Zealand and United Kingdom employed CAPM as a primary model to estimate the cost of equity while regulator in the United State of America utilized Dividend Discount Model (DDM) as the first option and CAPM as the second option. Vo (2015), in his recent work, argued that the application of the Fama-French three-factor model into public policy under the context of Australia is not recommended.

The central piece of the CAPM is its beta. A recent work by Savor and Wilson (2014) presented that beta is after all an important measure of systematic risk. They found that beta is strongly positively related to average excess return on days when inflation, employment, or Federal Open Market Committee interest rate decisions, which are generally considered sources of systematic risk, are announced. Overall, the key contribution of this Savor and Wilson (2014) study is that beta is still alive. This simply means that CAPM is still alive at least in the US market. From a status quo, our preferred approach is that CAPM and Fama-French three factor model are equally treated. Fama-French three-factor model has been proven to work well in the US market. However, it has equally been proven to not work well in the

Australian context (Vo, 2015). Equally, beta is still alive in the US market. A similar question is that whether or not beta is still alive in Australia? We are not aware of any study on the issue which has been conducted recently. This study is conducted to fill in the gap.

2 Empirical Review

In the empirical studies focusing on capital asset pricing model, undoubtedly, some of the most well-known are the work of Fama and MacBeth (1973) and Jensen, Black, & Scholes (1972). In relation to Fama and MacBeth's study, in order to examine the validity of CAPM on practice, they verified the risk-return tradeoff on the New York Stock Exchange. They observes that, on average, a linear positive relation between the two. Moreover, they also confirmed CAPM's hypothesis that except for beta, there is no measure of risk which possibly could systematically influence the return. In addition, Shapiro and Lakonishok (1984), in an effort to revive CAPM, spilt their data on market excess return. That is, they classified the observations into up market group (when market return is greater than the risk-free rate) and into down market group (when market return is less than the risk-free rate). They discovered that positive significant estimated beta's coefficient is associated with the former group and negative significant estimated beta's coefficient for the latter one. In a different language, as CAPM's prediction, high beta stocks do better in up market and worse in down market than low beta. Few years later, Pettengill, Sundaram and Mathur (1995), in the same data classification approach, continued to reaffirm the findings for the US market. As a result, they are considered as key contributors to the variant of CAPM, the so-called conditional capital asset pricing model.

Since the work by Shapiro and Lakonishok (1984) got published, research area on asset pricing has witnessed a significant number of studies to have been conducted. Among the studies, Lam (2001) for Hong Kong Stock Exchange perhaps is probably a prominent study in Asia Pacific region. This study demonstrated that beta and return are positive correlated in the up-market period while this relationship turns out to be negative in the down-market period. In addition, Tanga and Shumb (2003) investigated the conditional capital asset pricing model by employing data at global scale which includes many countries in the Pacific Ocean region.[1] Similar to Shapiro and Lakonishok (1984), the results confirmed that beta and return moved in the same direction as market return excess the risk-free rate. In short, findings from those

[1] This list contains Japan, Canada, US, Hong Kong, Singapore and Taiwan.

studies suggested that beta was a useful risk measure. Not only advocate of the CAPM was discovered in the Stock Exchange but also a majority of regulators in Australia, Germany, New Zealand, USA, Canada and UK still employ it to measure the cost of equity (Sudarsanam, Kaltenbronn, & Park, 2011).

In contrast, various studies have demonstrated their concerns of the CAPM which originated from its simplicity and implication. AL-Qudah and Laham (2013)**,** in their study on the determinants of stock return of 48 industrial companies listed in the Amman Stock Exchange from January 2000 to December 2009, argued that the statistically significant impact of systematic risk on stock return could not be established in the study. Moreover, employing data gathered from FAME database over the period of April 2000 to June 2007, Ramlogan and Bhatnagar considered that the Fama-French three-factor model (FF3F) was superior to explain the stock returns than the CAPM in United Kingdom stock market.

Daniel, Titman and Wei (2001) employed monthly data of listed firms on Tokyo Stock Exchange which account for nearly 85 per cent of the total market capitalization of Japan in the period of 1971-1997 to emphasize the role of characteristic model over the factor model. They classified firms into 25 portfolios to test the validity of CAPM and FF3F. One of their findings demonstrated that CAPM was highly unlikely appropriate whereas the FF3F is suitable for Japan.

In addition, Choudhary and Choudhary (2010), in their empirical paper, also concluded the same result in relation to the validity of CAPM from 1996 to 2009 in Bombay Stock Exchange. They stated that the stock excess return was not certainly explained by systematic risk. Particularly, higher ß was not associated with higher expected return and the intercept was statistically significant different from zero. Those findings contradict the implication of traditional CAPM that the market risk premium should be positive and the intercept should be zero. In conclusion, this research is consistent with Daniel, Titman and Wei (2001), Bajpai and Sharma (2015). Similarly, the risk-return tradeoff suggested by traditional CAPM was also not observed on the Malaysian Stock Exchange from 2001 to 2013 (Mollik, 2014) or Nigerian stock exchange (Oke, 2013; Olakojo and Ajide, 2010)

O'Brien, Brailsford and Gaunt (2008) stated that their findings advocated the superiority of the FF3F. The research utilized data in the period of 1982-2006 from Australian Stock Exchange which contains approximately 98 per cent of all listed Australian firms. The dataset played as an advantage over the perious papers which limited by time spanning and market coverage alike in the sense of the authors. The 25 Fama and French size and book to market portfolio formation was employed. In short, FF3F outperformed CAPM.

In contrast, Gharghori, Lee and Veeraraghavan (2009) concluded the same result through they demonstrated concerns in relation to the FF3F's application. In their study, for each variable of interest (e.g. market equity, book to market, earings to price, cashflow to price, leverage and share turnover), stocks were allocated into sextiles. After that, the CAPM regression and FF3F regression with GMM were made on six portfolios, respectively. The results which compressed by estimates, their t-statistic value, adjusted-R^2 and Wald test posited that the FF3F played a better role in stock return's explanation as compared to CAPM at least in the size effect, book to market effect, earnings to price effect and cashflow to price effect. Nevertheless, the FF3F cannot fit returns in some cashflow to price effect-differentiated portfolios. As such, it is far from conclusion that FF3F could be deployed in Australia as it used to be in the US.

Focusing on the invalidity of FF3F on practice, Vo (2015) posited that FF3F probably was an seminal effort for academic purposes but the adoptation of the model into practice was problematic; and as such, the model is recommeneded in the context of Australia. The conclusion extracted from the numerical results of factor loadings and intercepts in the FF3F model were not in line with the expectation. Particularly, from the dataset covered stock return of Australian listed firms in the five-year period 2009-2014, the author employed five different data classification approaches adopted in the previous to build up tested portfolios for the verification of FF3F. More importantly, prior to the portfolio formation process, observations were filtered by three distinguish scenarios. That is, for each scenario, five different data classifcation approaches were deployed later. Under each test portfolio, he utilized Fama-MacBeth regression to figure out the estimated coefficients of market factor, size factor and value factor. In addition, the researcher also argued that those estimated coefficients must be positive number and the intercepts were not statistically significant different from zero in all portfolios to reflect the nature tradeoff between return on equity and factor. However, this prerequisites were not satisfied because of the HML's factor loading exhibited inverse relation in nearly all tested portfolios. In relation to two other factors, market's factor loading demonstrated the same phenomenon in the two first scenarios, whereas negative SMB's factor loading was observed in third scenario.

3 Data and Methodology

3.1 A choice of Australia in this study

It is optimal if this study is conducted using data from Vietnam. However, a preliminary analysis indicates that a substantially large volume of data is required for this type of study. In addition, one of the key cornerstones of this empirical study is the availability of various announcements in relation to macroeconomic issues such as economic growth, money supply, unemployment and the others. Unfortunately, this type of data is not publicly and substantially available in Vietnam.

From 30 countries including in the Asia Pacific region, Australia is the best candidate at least on the following aspects: (i) a substantially large volume of data for listed firms are available (more than 2,200 listed firms for more than 20 years of data); (ii) announcements of macroeconomic issues are publicly available and they are transparently recorded; (iii) Australia is by all means a small, open, and advanced economy in the region; and (iv) support from the access of data is available and confirmed. As such, Australia is selected for the purpose of this study.

3.2 A brief description of the method

The main purpose of this research is to consider the validity of CAPM under the context of Australia. This study adopts the approach from Savor and Wilson (2014) is that all observations are separated into a-day (*announcement days*) group as it is related to days on which *growth*, *inflation*, *employment*, *central bank announcements*, *bonds*, *housing*, *consumer surveys*, *business surveys* and *speeches* from the Prime Minister or the Governor of the Reserve Bank of Australia scheduled to be announced and n-day (*non-announcement days*) group as it pertains to the other days. In short, the CAPM equation under nested data separation is represented as follows:

$$R_{it} - R_f = \alpha_0 + \alpha_1 D + (R_m - R_f)\beta_{it} + (R_m - R_f)D\beta_{it} + \varepsilon_{it}$$

Where:

- R_{it}: The return of i stock/ portfolio.
- R_f: The risk-free rate.
- R_m: The market return.
- β_{it}: The response of stock's return with respect to return of market portfolio.
- D: Dummy variable. D = 1 if day is announcement day and vice versa.

The daily return is measured by the difference in natural logarithmic of two continuous stock close prices. Mathematically, the daily return is expressed as follows:

$$R_{i,t} = ln(\text{Close Price}_{i,t}) - ln(\text{Close Price}_{i,t-1})$$

3.3 Data requirements and data sources

Data covers all Australian listed firms on Australian Securities Exchange from Bloomberg from 1 January 2007 to 31 December 2016. Two additional required inputs for CAPM, being the risk-free rate and the market returns, are also collected from the same source and the same period. The risk-free rate's proxy-Commonwealth Government bonds from Reserve Bank of Australia with the maturity of 10 years-is adopted in this study. The market return is the return summation of all listed Australian firms collected by this research.[2]

Moreover, the dataset also records news (day of issue, impact) in relation to event types such as *growth*, *inflation*, *employment*, *central bank announcements*, *bonds*, *housing*, *consumer surveys*, *business surveys* and *speeches* from the Prime Minister or the Governor of the Reserve Bank of Australia. Days contain at least one of those event types are called *announcement days* or **a-days** and vice versa. Moreover, their impacts on market-moving potential are collected and classified into three levels: (i) high expected impact; (ii) medium expected impact and (iii) low expected impact. In the case of more than one impact levels are presented, the highest one would be chosen. Those data are available and judged by Forex Factory website (http://www.forexfactory.com/). In addition, for consistency, this segment of dataset spans from1 January 2007 to 31 December 2016.

3.4 Portfolio constructions

Beta is after all a crucial measure of systematic risk and it is at the heart of the CAPM which can be used to estimate asset return. In this paper, the beta estimates are used as an important determinant of asset returns in announcement days as compared to other days. In the context of the United State of America, Savor and Wilson argued that stock market beta was strongly related to average returns in ten-beta sorted portfolio, the 25 Fama and French size and book-to-market portfolio, ten-idiosyncratic risk sorted portfolio, industry portfolio and even for non-equity asset such as government bonds and currency carry-trade portfolio. Therefore, it is essentially to demonstrate CAPM's performance on those portfolios if the targeted market is not US. However, due to data is not available for government bonds and

[2] The Australian Securities Exchange's index could be referred to the S&P/ASX 20, S&P/ASX 50, S&P/ASX 200, S&P/ASX 300 and All Ordinaries

currency carry-trade portfolio, this study adopts the first fourth portfolios to examine the validity of CAPM in the context of Australia.

3.4.1 Ten beta-sorted portfolios and Ten idiosyncratic risk-sorted portfolios

In relation to 10 beta-sorted portfolios, each firm in the dataset is allocated to the corresponding portfolio by the following procedure. *First,* for each year, separately for announcement day and non-announcement day, individual stock market beta was estimated using one year of daily returns, then firm was sorted into deciles due to the estimated beta. In a simple language, all firms in the dataset were allocated into one of the ten portfolios. For each year, the first portfolio was featured by the 10 per cent lowest-beta while the tenth portfolio comprises the top 10 per cent highest-beta. Those kinds of portfolios were rebalanced every year. Technically, the one year rolling beta was produced using the ordinary least square for the following equation:[3]

$$R_{it} - R_{ft} = \alpha_{it} + b_i(R_{mt} - R_{ft}) + \mu_{it}$$

Similarly, the idiosyncratic risk-sorted portfolio was constructed in the same manner. However, it is noted that for this portfolio formation, every time the individual stock market beta was generated, the standard deviation of return residual of the foregoing equation was record, too. Then, firm was also sorted into deciles due to that statistical number. Particularly, for a year, the first portfolio contains top 10 per cent lowest-standard deviation of return residual. Meanwhile, the materials of tenth portfolio are top 10 per cent highest-standard deviation of return residual. The idiosyncratic risk-sorted portfolios were rebalanced annually.

[3] According to the central limitation theorem, the one year rolling beta is estimated only if the minimal observation-30-is satisfied.

Table 1 Summary of the number of firms in 10 beta-sorted portfolios

Year	Category	The number of firms in the portfolio										Total
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
2007	beta-sorted portfolio (a-day)	110	109	109	109	109	109	109	109	109	109	1091
	idiosyncratic risk portfolio (a-day)	110	109	109	109	109	109	109	109	109	109	1091
	beta-sorted portfolio (n-day)	96	95	95	96	95	95	96	95	95	96	954
	idiosyncratic risk portfolio (n-day)	96	95	95	96	95	95	96	95	95	96	954
2008	beta-sorted portfolio (a-day)	110	109	109	109	109	109	109	109	109	110	1092
	idiosyncratic risk portfolio (a-day)	110	109	109	109	109	109	109	109	109	110	1092
	beta-sorted portfolio (n-day)	74	74	74	74	74	73	74	74	74	74	739
	idiosyncratic risk portfolio (n-day)	74	74	74	74	74	73	74	74	74	74	739
2009	beta-sorted portfolio (a-day)	107	106	106	106	106	106	106	106	106	106	1061
	idiosyncratic risk portfolio (a-day)	107	106	106	106	106	106	106	106	106	106	1061
	beta-sorted portfolio (n-day)	74	73	73	73	73	73	73	73	73	73	731
	idiosyncratic risk portfolio (n-day)	74	73	73	73	73	73	72	74	73	73	731
2010	beta-sorted portfolio (a-day)	117	116	116	116	116	116	116	116	116	116	1161
	idiosyncratic risk portfolio (a-day)	117	116	116	116	116	116	116	116	116	116	1161
	beta-sorted portfolio (n-day)	89	89	88	89	89	88	89	88	89	89	887
	idiosyncratic risk portfolio (n-day)	89	89	88	89	89	88	89	88	89	89	887
2011	beta-sorted portfolio (a-day)	126	125	125	125	126	125	125	125	125	126	1253
	idiosyncratic risk portfolio (a-day)	126	125	125	125	126	125	125	125	125	126	1253
	beta-sorted portfolio (n-day)	92	92	92	92	92	92	92	92	92	92	920
	idiosyncratic risk portfolio (n-day)	92	92	92	92	92	92	92	92	92	92	920
2012	beta-sorted portfolio (a-day)	121	121	120	121	121	120	121	120	121	121	1207
	idiosyncratic risk portfolio (a-day)	121	121	120	121	121	120	121	120	121	121	1207
	beta-sorted portfolio (n-day)	84	83	83	83	83	83	83	83	83	83	831
	idiosyncratic risk portfolio (n-day)	84	83	83	83	83	83	83	83	83	83	831
2013	beta-sorted portfolio (a-day)	121	121	120	121	121	120	121	120	121	121	1207
	idiosyncratic risk portfolio (a-day)	121	121	120	121	121	120	121	120	121	121	1207
	beta-sorted portfolio (n-day)	87	87	87	86	87	87	86	87	87	87	868
	idiosyncratic risk portfolio (n-day)	87	87	87	86	87	87	86	87	87	87	868
2014	beta-sorted portfolio (a-day)	129	128	128	128	128	128	128	128	128	129	1282
	idiosyncratic risk portfolio (a-day)	129	128	128	128	128	128	128	128	128	129	1282
	beta-sorted portfolio (n-day)	95	94	95	94	95	94	94	95	94	95	945
	idiosyncratic risk portfolio (n-day)	95	94	95	94	95	94	94	95	94	95	945
2015	beta-sorted portfolio (a-day)	133	133	133	132	133	133	132	133	133	133	1328
	idiosyncratic risk portfolio (a-day)	133	133	133	132	133	133	132	133	133	133	1328
	beta-sorted portfolio (n-day)	100	99	99	99	99	99	99	99	99	99	991
	idiosyncratic risk portfolio (n-day)	100	99	99	99	99	99	99	99	99	99	991
2016	beta-sorted portfolio (a-day)	143	143	143	142	143	143	142	143	143	143	1428
	idiosyncratic risk portfolio (a-day)	143	143	143	142	143	143	142	143	143	143	1428
	beta-sorted portfolio (n-day)	90	89	89	90	89	89	90	89	89	90	894
	idiosyncratic risk portfolio (n-day)	90	89	89	90	89	89	90	89	89	90	894

Source: Authors' calculation

3.4.2 The 25 Fama-French size and book-to-market portfolios

To construct the 25 Fama and French size and book-to-market portfolio, this research inherited the work of Fama and French (1996). Particularly, from the top view, that approach of portfolio construction is related to two financial indicators: market capitalization value and book value. In addition, to be suitable to the Australian firm, the market capitalization and book-to-market were both collected at the end of each June. Together with beta-sorted portfolio and idiosyncratic risk-sorted portfolio, the 25 Fama and French size and book-to-market portfolios are also updated every year. The adoption occurred as follows: given the statistical numbers on market capitalization of all firms in the dataset, four breakpoints were manipulated.

Next, each firm was classified into one of five portfolios based on its market capitalization magnitude to those of four breakpoints. As a result, the first portfolio includes top 20 per cent lowest-market capitalization firms. For the second portfolio, it encompasses the next top 20 per cent lowest-market capitalization firms. For the third portfolio, there are next top 20 per cent lowest-market capitalization firms. To the fourth portfolio, it was constructed from the next top 20 per cent lowest-market capitalization firms. Finally, the last portfolio contains the rest firms in the dataset. Visually, after the market capitalization allocation process, there are five segments. Each segment contains the same number of firms. Next, in relation to book-to-market dimension, given the statistical number on book-to-market of all firm in each foregoing segment, four breakpoints were determined. Then, each firm was classified into one of five portfolios based on its book-to-market magnitude to those of four breakpoints. As a result, each segment are divided into five smaller part in which each part is featured by the same number of firms. Finally, at the end of two processes, there are 25 portfolios and each portfolio includes equal number of firms.

Table 2 Summary of the number of firms in the 25 Fama-French size and book-to-market portfolios

Year	Category	The number of firms in the portfolio																									Total
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	
2008	25FF (a-day)	41	41	41	41	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	41	41	40	41	41	1009
	25FF (n-day)	41	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	1001
2009	25FF (a-day)	49	49	49	49	49	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	49	48	49	48	49	1208
	25FF (n-day)	48	48	48	48	48	48	48	48	48	48	48	47	47	47	47	48	48	48	48	48	48	48	48	48	48	1196
2010	25FF (a-day)	51	51	51	51	51	50	50	50	50	50	51	50	50	50	50	50	50	50	50	50	51	51	51	51	51	1261
	25FF (n-day)	51	51	51	51	51	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	51	51	50	51	51	1259
2011	25FF (a-day)	52	52	52	52	52	52	52	52	52	52	52	51	51	51	52	52	52	52	52	52	52	52	52	52	52	1297
	25FF (n-day)	52	52	52	52	52	52	51	51	51	52	51	52	52	52	51	52	51	51	51	52	52	52	52	52	52	1292
2012	25FF (a-day)	57	57	57	57	57	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56	57	56	56	56	56	1406
	25FF (n-day)	56	56	56	56	56	56	56	56	56	56	56	56	55	56	56	56	56	56	56	56	56	56	56	56	56	1399
2013	25FF (a-day)	60	60	60	60	60	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	60	60	60	60	60	1485
	25FF (n-day)	60	59	59	59	60	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	59	1477
2014	25FF (a-day)	62	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	1526
	25FF (n-day)	61	61	61	61	61	61	61	61	61	61	61	60	60	60	60	61	61	61	61	61	61	61	61	61	61	1521
2015	25FF (a-day)	64	64	64	64	64	63	63	63	63	63	64	63	64	63	64	63	63	63	63	63	64	64	64	64	64	1588
	25FF (n-day)	64	64	64	64	64	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	1580
2016	25FF (a-day)	67	67	67	67	67	67	66	66	66	66	66	67	67	67	67	67	66	66	66	66	67	67	67	67	67	1666
	25FF (n-day)	67	67	66	67	67	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	1654

Source: Authors' calculation

3.4.3 Industry portfolios

In relation to industry portfolio, this research adopts the Global Industry Classification Standard (GICS) to classify for all firms in the dataset into sub-sectors. The following table summarizes the distribution of firms across sectors.

Table 3 Summary of the number of firms in industry portfolios

Industry	The number of firms
Consumer Discretionary	161
Consumer Staples	55
Energy	217
Financials	123
Health Care	144
Industrials	169
Information Technology	171
Materials	631
Real Estate	83
Telecommunication Services	20
Utilities	22
Total	1796

Source: Authors' calculation

3.5 Calculations of portfolio's beta and portfolio's return.

After allocating stock into different 10 portfolios as discussed above, the next step in this study is to estimate beta for each of the 10 portfolios, using different portfolio formations, and its returns. Beta coefficients are then tested to confirm whether or not they are statistically different on the announcement days and non-announcement days. Technically, the following panel regression is conducted:

$$R_{i,t+1} - R_{f,t+1} = \alpha_0 + \gamma_1 D_{t+1} + \gamma_2 \beta_{i,t} + \gamma_3 D_{t+1} \beta_{i,t} + \mu_{i,t+1}$$

Where $R_{i,t+1} - R_{f,t+1}$ is the expected return in excess of the risk-free rate of portfolio i. $\beta_{i,t}$ is the individual portfolio market beta. D_{t+1} is a dummy variable whose value is one if the expected excess return at t + 1 represents for announcement day and vice versa. Moreover, to avoid the existence of heteroskedasticity, this research utilizes the Feasible Generalized Least Squares (FGLS) estimation.

The two key variables in the above equation are the expected excess return of portfolio and its market beta.

In relation to the expected excess return, to each year as stock allocated into portfolio, their return in the next year is employed to calculate the portfolio return separately for announcement day and non-announcement day. Particularly, to each announcement day of the next period, the daily portfolio expected excess return is the weighted average of its stock expected excess return where individual stock market capitalization was utilized as a weight. Then, those daily portfolio's returns is averaged across time.

Concerning about portfolio's market beta, to each year as stock allocated into portfolio, by the same process, the daily portfolio's returns is manipulated as a weighted average of its stock excess return where individual stock market capitalization was employed as a weight. Noticeable, in contrast, the return in that year is employed instead of return of next year. Those daily portfolio's return whose role plays as an independent variable was regressed again the corresponding market risk premium in the CAPM to figure out the portfolio's market beta.

4 The empirical results

This section presents empirical results produced from applying the pooled regression and portfolio construction as discussed above.

Table 4 Daily expected excess return on Announcement day and Non-announcement day

Pooled regression		
Ten-beta sorted portfolio		
Intercept	Aday*Beta	R^2
0.0000612 [0.25]	**-0.000632** **[-1.71]**	0.1424
Idiosyncratic risk-sorted portfolio		
Intercept	Aday*Beta	R^2
0.0005325 [0.69]	**-0.0015908** **[-2.00]**	0.0529
25 Fama and French size and book-to-market portfolio		
Intercept	Aday*Beta	R^2
0.0029453 [6.69]	**-0.0024716** **[-4.43]**	0.0215
Industry portfolio		
Intercept	Aday*Beta	R^2
0.000235 [0.36]	**0.0010287** **[1.15]**	0.0506

t-statistics are reported in parentheses

Source: Authors' estimates

The above results indicate that, for the value-weighted portfolios, the implied risk premiums are different on announcement days and non-announcement days for all investigated portfolios with the exception to the industry portfolios. In particular, the a-day*beta coefficient equals **-6.32** bps and is statistically different from zero (significant at level of 10 per cent level) for the ten-beta sorted portfolio. Similarly, with respect to the idiosyncratic risk-sorted portfolio, the a-day*beta coefficient is **-15.9** bps and statistically significant different from zero (significant at level of 5 per cent). In the same manner, in relation to the 25 Fama-French size and book-to-market portfolio, the results also demonstrate that the implied risk premiums on announcement day and non-announcement day are not equal.

From the results, it could be inferred that, at least in the three constructed and utilized portfolios in this study: (i) 10 beta-sorted portfolios; (ii) 10 idiosyncratic risk-sorted portfolios and (iii) the 25 Fama-French size and book-to-market portfolios, beta is *negatively* related to daily expected excess return in the announcement days in comparison to the non-announcement days. This finding is interesting to interpret. In contrast with the findings for the US where on announcement days the relation between average returns and beta is strongly positive, the finding for Australia about this relationship is statistically significant and negative. This can be explained by the fact that Australia is a small open economy whose economic activities are heavily influenced by other advanced and major trading partners such as the US. As such, announcements by the Australian authorities appear to bring good news for the Australian economy because the news are considered as the responding factors to what have been decided and announced by other major countries including the US.

In summary, the findings from this research conducted for Australia is consistent with the results of Savor and Wilson (2014) for the US that beta and average daily expected excess return are strongly related on the announcement days. These findings support the conclusions in the context of 10 beta-sorted portfolios, 10 idiosyncratic risk-sorted portfolios and 25 Fama-French size and book-to-market portfolios, not for industry portfolios.

5 Concluding remarks

The Capital Asset Pricing Model (CAPM) has been adopted by economic regulators; policymakers and financial practitioners around the world for an extended period of time of more than 50 years. However, its validity has been challenged by the introduction of the Fama-French three-factor model in 1992. A recent work by Savor and Wilson (2014) using the US data confirmed that beta, the heart of the CAPM, is after all an important measure of systematic risk. This study is conducted to examine the validity of the CAPM in the context of Australia on the ground of Savor and Wilson (2014), the first attempt ever for the Asia Pacific region. Daily data for more than 2,200 Australian listed firms are collected from Bloomberg for the period from 1 January 2007 to 31 December 2016.

In this study, four portfolios are considered including: (i) 10 beta-sorted portfolios; (ii) 10 idiosyncratic risk-sorted portfolios (iii) 25 Fama-French size and book-to-market portfolios;

and (iv) industry portfolios. With the focus on beta with the view to examine the relationship between beta and the expected return for stocks, in this study, days with the announcements (the *a-day*) in relation to *growth*, *inflation*, *employment*, *central bank announcements*, *bonds*, *housing*, *consumer surveys*, *business surveys* and *speeches* from the Prime Minister or the Governor of the Reserve Bank of Australia scheduled to be announced are allocated into a group which is separated from the *n-day* (*non-announcement days*) group.

Using the ordinary least square estimation method on the above four distinct types of portfolios (beta sorted portfolio, idiosyncratic risk-sorted portfolio, 25 Fama-French size and book-to-market portfolio and industry portfolio), this study finds that the implied risk premium on announcement day is statistically different from that of non-announcement day. These findings hold for all different formations of portfolios with the exception for the industry portfolios. In a simple language, findings from this study indicate that beta is negatively related to daily expected excess return in the announcement days in comparison to the non-announcement days. On balance, CAPM has proved to be a valid approach for estimating a return in Australia.

References

AL-Qudah, A., & Laham, M. (2013). The Effect of Financial Leverage & Systematic Risk on Stock Returns in the Amman Stock Exchange (Analytical Study – Industrial Sector). *Research Journal of Finance and Accounting, 4*(6).

Bajpai, S., & Sharma, A. K. (2015). An Empirical Testing of Capital Asset Pricing Model in India. *Procedia - Social and Behavioral Sciences, 189*, 259-265.

Brounen, D., Jong, A. d., & Koedijk, K. (2004). Corporate Finance in Europe: Confronting Theory with Practice. *Financial Management*, 71-101.

Choudhary, K., & Choudhary, S. (2010). Testing Capital Asset Pricing Model: Empirical Evidences from Indian Equity Market. *Eurasian Journal of Business and Economics, 3*(6), 127-138.

Daniel, K., Titman, S., & Wei, K. J. (2001). Explaining the Cross-Section of Stock Returns in Japan: Factors or Characteristics? *The Journal of Finance, 56*(2), 743-766.

Fama, E. F., & MacBeth, J. D. (1973). Risk, Return and Equilibrium: Empirical Tests. *Journal of Political Economy, 81*, 607-636.

Fama–MacBeth regression. (2016, December 29). Retrieved from Wikipedia, The Free Encyclopedia.: https://en.wikipedia.org/w/index.php?title=Fama%E2%80%93MacBeth_regression&oldid=757221727

Gharghori, P., Lee, R., & Veeraraghavan, M. (2009). Anomalies and stock returns: Australian evidence. *Accounting & Finance, 49*(3), 555-576.

Graham, J. R., & Harvey, C. R. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics*, 187–243.

Henry, Ó. T., & Street, C. (2014). Retrieved from https://www.aer.gov.au/system/files/D14%2052760%20%20Estimating%20Beta_%20An%20update%20Olan%20T%20Henry%20April%202014.pdf

Jensen, M. C., Black, F., & Scholes, M. (1972). The Capital Asset Pricing Model: Some Empirical Tests. *Michael C. Jensen, STUDIES IN THE THEORY OF CAPITAL MARKETS, Praeger Publishers Inc.*

Lam, K. S. (2001). The conditional relation between beta and returns in the Hong Kong stock market. *Applied Financial Economics*, 669-680.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics, 47*(1), 13-37.

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance, 7*(1), 77-91.

Mckenzie, M., & Partington, G. (2014). *Return on Equity.* A report prepared for the Australian Energy Regulator. Retrieved from https://www.aer.gov.au/system/files/Michael%20McKenzie%20%26%20Graham%20Partington%20%E2%80%93%20Report%20to%20the%20AER,%20Part%20A-Return%20on%20Equity%20%E2%80%93%20October%202014_0.PDF

Mollik, A. T. (2014). The CAPM and risk-return anomalies in Asian emerging markets : evidence from Bangladesh and Malaysia. *The 11th Asian Business Research Conference 2014* (pp. 1-24). Dhaka, Bangladesh: Australia : World Business Institute.

O'Brien, M. A., Brailsford, T., & Gaunt, C. (2008, August 5). *Size and Book-to-Market Factors in Australia.* Retrieved from SSRN: http://dx.doi.org/10.2139/ssrn.1206542

Oke, B. O. (2013). Capital Asset Pricing Model (CAPM): Evidence from Nigeria. *Research Journal of Finance and Accounting, 4*(9).

Olakojo, S., & Ajide, K. (2010). Testing the Capital Asset Pricing Model (CAPM): The Case of the Nigerian Securities Market. *International Business Management, 4*(4), 239-242.

Pettengill, G. N., Sundaram, S., & Mathur, I. (1995). The Conditional Relation between Beta and Returns. *The Journal of Financial and Quantitative Analysis, 30*(1), 101-116.

Quantile regression. (2016, July 29). Retrieved from Wikipedia, The Free Encyclopedia: https://en.wikipedia.org/w/index.php?title=Quantile_regression&oldid=732093948

Ramlogan, R., & Bhatnagar, C. S. (n.d.). The Capital Asset Pricing Model versus The Three Factor Model: A United Kingdom Perspective. *Third Biennial International Conference on Business, Banking and Finance.* Retrieved from https://sta.uwi.edu/conferences/09/finance/documents/Riad%20Ramlogan%20and%20C%20 Bhatnagar.pdf

Savor, P. G., & Wilson, M. I. (2014). Asset Pricing: A Tale of Two Days. *Journal of Financial Economics, 113*(2), 171-201.

Shapiro, A. C., & Lakonishok, J. (1984). Stock Returns, Beta, Variance and Size: An Empirical Analysis. *Financial Analysts Journal, 40*(4), 36-41.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance, 19*(3), 425-442.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *The Journal of Finance, 19*(3), 425-442.

Sudarsanam, S., Kaltenbronn, U., & Park, P. (2011). Cost of Equity for Regulated Companies: An international Comparison of Regulatory Practices. Cranfield School of Management, UK, and Member, Competition Commission, UK.

Tanga, G. Y., & Shumb, W. C. (2003). The conditional relationship between beta and returns: recent evidence from international stock markets. *International Business Review, 12*(1), 109-126.

Vo, D. H. (2015). Which Factors Are Priced? An Application of the Fama French Three-Factor Model in Australia. *Economic Papers, 34*(4), 290-301.

Vo, D. H., Mero, S., & Gellard, B. (2014). Equity beta for the Australian Utilities is well below 1.0. *Paper Presented at Australian Econometric Society Meeting.* Hobart, Australia.